

## ABSTRAK

Baja tahan karat SS304 banyak digunakan pada berbagai komponen industri karena memiliki ketahanan korosi dan sifat mekanik yang baik. Namun, kekerasan permukaannya relatif rendah sehingga berpotensi mengalami keausan ketika menerima gesekan dan beban mekanis secara berulang. Penelitian ini bertujuan untuk menganalisis pengaruh tekanan udara dan durasi proses *shot peening*, serta interaksi kedua parameter tersebut terhadap peningkatan kekerasan permukaan baja SS304. Penelitian menggunakan metode eksperimen kuantitatif dengan variasi tekanan udara sebesar 3, 4, dan 5 bar serta durasi penyemprotan selama 60, 120, dan 180 detik. Proses *shot peening* menggunakan media *steel shot* S170 berdiameter 0,4 mm, jarak nozel 100 mm, dan sudut penyemprotan 90°. Sembilan kombinasi perlakuan diuji dengan tiga kali pengulangan sehingga diperoleh 27 data spesimen. Kekerasan permukaan diukur menggunakan metode Rockwell B, kemudian dianalisis menggunakan *Two-Way Analysis of Variance* (ANOVA). Hasil penelitian menunjukkan bahwa spesimen tanpa perlakuan memiliki kekerasan sebesar 70,00 HRB, sedangkan kekerasan tertinggi sebesar 88,52 HRB diperoleh pada kombinasi tekanan 5 bar dan durasi 180 detik, atau meningkat sebesar 26,46%. Hasil ANOVA menunjukkan bahwa tekanan udara berpengaruh signifikan terhadap kekerasan dengan nilai F sebesar 75,01 dan  $p\text{-value} < 0,001$ , sedangkan durasi penyemprotan menghasilkan nilai F sebesar 87,40 dan  $p\text{-value} < 0,001$ . Interaksi tekanan udara dan durasi penyemprotan juga berpengaruh signifikan dengan nilai F sebesar 3,13 dan  $p\text{-value}$  sebesar 0,0403. Durasi penyemprotan memberikan kontribusi terbesar, yaitu 49,19%, diikuti tekanan udara sebesar 42,22% dan interaksi keduanya sebesar 3,53%. Dengan demikian, peningkatan tekanan udara dan durasi penyemprotan dapat meningkatkan kekerasan permukaan baja SS304, dengan kombinasi paling optimal pada tekanan 5 bar dan durasi 180 detik

**Kata kunci:** Baja tahan karat SS304, Shot peening, Tekanan udara, Durasi penyemprotan, Kekerasan permukaan, ANOVA dua arah.

## **ABSTRACT**

*SS304 stainless steel is widely used in various industrial components because of its good corrosion resistance and mechanical properties. However, its relatively low surface hardness may increase the risk of wear when subjected to repeated friction and mechanical loads. This study aims to analyze the effects of air pressure and shot peening duration, as well as the interaction between these parameters, on the surface hardness of SS304 stainless steel. A quantitative experimental method was employed using air-pressure variations of 3, 4, and 5 bar and shot peening durations of 60, 120, and 180 seconds. The shot peening process used S170 steel shot with a diameter of 0.4 mm, a nozzle distance of 100 mm, and an impact angle of 90°. Nine treatment combinations were tested with three replications, resulting in 27 experimental data sets. Surface hardness was measured using the Rockwell B method, and the resulting data were analyzed using Two-Way Analysis of Variance (ANOVA). The results showed that the untreated specimen had a hardness value of 70.00 HRB, while the highest hardness value of 88.52 HRB was obtained at an air pressure of 5 bar and a duration of 180 seconds, representing an increase of 26.46%. The ANOVA results indicated that air pressure had a significant effect on surface hardness, with an  $F$ -value of 75.01 and a  $p$ -value of less than 0.001. Shot peening duration also had a significant effect, with an  $F$ -value of 87.40 and a  $p$ -value of less than 0.001. Furthermore, the interaction between air pressure and duration was significant, with an  $F$ -value of 3.13 and a  $p$ -value of 0.0403. Shot peening duration provided the greatest contribution at 49.19%, followed by air pressure at 42.22% and their interaction at 3.53%. Therefore, increasing air pressure and shot peening duration can improve the surface hardness of SS304, with the optimum combination obtained at 5 bar and 180 seconds.*

**Keywords:** SS304 stainless steel, Shot peening, Air pressure, Spraying duration, Surface hardness, Two-Way ANOVA.